

REMARKS

Responsive to the outstanding Office Action, applicant has carefully studied the Examiner's rejections and the comments relative thereto. Favorable reconsideration of the application is respectfully requested in light of the amendments and following detailed arguments.

In the amendment, claim 25 was amended. It is submitted that no new matter has been entered into the claims through these amendments.

REJECTIONS UNDER 35 USC §112, second paragraph and OBJECTIONS TO THE CLAIMS

The Examiner rejected claims 25-26 under 35 USC 112, second paragraph, for indefiniteness.

Claim 25 has been amended herein to specify within that claim that the upper time limit is 600 seconds, which corresponds to the value in the independent claim. As the upper value is the same in both claims, and the lower value of dependent claim 25 is greater than the value of independent claim 16, it is submitted that this claim properly defines a narrower range than that of the independent claim. Therefore, it is believed that this claim is correctly defined under 35 USC 112, second paragraph, and is not indefinite. It is therefore believed that these claims fully comply with the requirements of 35 USC 112, second paragraph. Further, it is submitted that the objections to these claims have been overcome.

In view of the above, reconsideration and withdrawal of the rejections under 35 USC 112, second paragraph are respectfully requested.

REJECTIONS UNDER 35 USC §103

The Examiner rejected claims 16-28 and 31-33 under 35 USC 103 as being unpatentable over Taniguchi et al. The Examiner states that Tanaguchi teaches making shaped or coated articles, that may be optical particles, using a mixture of fine inorganic particles in a matrix material that may be polymeric compounds. The Examiner acknowledges that Tanaguchi does not disclose information on energies of the ions as

they impinge on the substrate or discuss the presence of a refractive index gradient nor the wavelengths involved in the total luminous transmittance measurements. The Examiner states, however, that these numbers would have been obvious to one of ordinary skill in the art.

Claim 16, as amended, defines a process for reducing the surface reflectance of polymer substrates to less than 2% in the wavelength range from 400 nm to 1100 nm. A refractive index gradient layer is formed by means of ion bombardment using high-energy ions which are generated by means of an argon and oxygen plasma as plasma ion source. The ions impacting at least one substrate surface during the ion bombardment have an energy of from 100 eV to 160 eV, and the duration of the ion bombardment is from 200 to 600 s, and the ion bombardment is carried out until a refractive index gradient layer with a thickness of at least 230 nm has been formed.

The present invention involves directly impacting the surface of a polymer substrate with ions under conditions mentioned in independent claim 16. The disclosure of Taniguchi addresses a process for producing transparent shaped articles with enhanced anti-reflecting effect. The treatment with an activated gas forms an anti-reflective thin film on a surface of an optical transparent article. The film formed thereby contains finely divided particles of an inorganic substance. These particles have an average particle size in the range 1 to about 300 milli-microns (as reflected in claim 1).

Taniguchi is strictly limited to the production of transparent articles. This requires that finely divided inorganic particles are enclosed in an additional coating on the surface of the substrate.

Taniguchi suggests the use of an activated gas for the treatment of a substrate coated as suggested in Tanaguchi. Several ways of activating the gas are possible: corona discharge, direct current, low-frequency, high-frequency or microwave high voltage discharge by low pressure conditions. The activating gas means that the gas contains ions, electrons and/or an excited gas. Each of these are different in terms of properties which could be utilized by the process. Taniguchi suggests no consideration

of these various properties, nor any indication to use any particular set of conditions to obtain any particular result.

The particular properties desired herein require precise compliance with the parameters defined in claim 16. The precise energy of the ions (100-160 eV) and time (200 to 600 s) along with a plasma from argon and oxygen are significant to the desired result. The refractive index gradient layer with a thickness of at least 230nm will be formed only through the modification of the surface material at the treated surface with these parameters.

The activation of the gas according to Taniguchi should be achieved by the use of an ashing apparatus (model IPC 1003B) manufactured by International Plasma Corporation. It is not described therein how a plasma is generated by such an apparatus. Taniguchi mentions a power of 50W and defines a gas flow rate. Table 1 of Taniguchi defines treatment times and flow rates in table 1. Generally in the shown examples of Taniguchi only one gas has been activated, and further, the form of the gas activated, ions, electrons or excited gases, is also not disclosed in the Taniguchi reference.

It is acknowledged that the use of plasma for modification or coating of different substrate materials is known in the art. However, the specific conditions and parameters cause great variances in product properties, and are not generally known or predictable. In most circumstances, specifically chosen parameters are necessary to obtain the desired results.

The Taniguchi reference is limited in to the features described above. Any conclusion that the parameters of the present invention would be derived from the teachings of the Taniguchi reference would require hindsight analysis based upon the present disclosure. There is nothing in Taniguchi to teach or suggest the specific features of any particular utility in the present invention as claimed in claim 16.

It is additionally submitted that Taniguchi utilizes inorganic particles which are applied with an organic binder onto a surface of a substrate. The mixture is applied through a wet-chemical application process. An etching process with plasma is used to remove adjacent organic components. The surface layer of Taniguchi is thus formed

from the inorganic particles. As a result of the etching process, hollow cavities are formed at the surface and the layer has a lower refractive index and reflectivity.

The present invention, by contrast, utilizes a self organized formation of a structure inside an organic polymer which takes place at the surface. The structure formed onto the surface is also formed from the same polymer. While it is well known in the art to utilize plasma for removal of different materials, the formation of a surface structure is only possible by the precise conditions described in the present invention.

The wet-chemical application process of Taniguchi has a complete filling of all cavities at the surface and unevenness at the surface is eliminated. This method is not usable by shaped surfaces such as Fresnel lenses (as an example). The present invention, to the contrary, advantageously handles polymeric substrates with many different shaped surfaces. An optical element formed by the method of Taniguchi has a reduced reflectivity which is in a range lower than the reduced reflectivity attainable through the present invention. While the transparency of a lens produced by Taniguchi may reach, at best, a value of 98%, lenses produced according to the invention process can have a transparency of more than 99%. This difference in transparencies can be very significant in a number of applications. Thus the present invention yields a superior product to that of the applied reference, and is not disclosed by the applied reference.

It is therefore submitted that claim 16, and the claims dependent therefrom, are allowable over the applied art of record.

DOUBLE PATENTING

Claims 16-28 and 31-33 were also provisionally rejected under the doctrine of non-statutory obviousness-type double patenting as being unpatentable over claims 1-7, 12-18 and 24-25 of copending application 11/662,550.

The present invention has an earlier filing date than that of the copending referenced application, and also an earlier priority date. Therefore, even if a double patenting rejection were warranted it is respectfully submitted that the present application would have the superior date and a terminal disclaimer would not be warranted herein.

However, copending Application 11/662,550 is drawn to a method for forming an optical element for absorbing radiation. This is illustrated in claim 1 of the copending application which claims "a method for the manufacture of a radiation-absorbing optical element that includes a substrate of plastic, comprising the steps of: forming a layer with a graduated refractive index on at least one surface of the substrate, and subsequently applying a metal layer onto the layer with the graduated refractive index."

This is in contrast to the present method for reducing the surface reflectance of an optical element which is formed according to the claimed present invention, requiring argon and oxygen as opposed to a metal. The coating materials are different as are the process steps involved. Further, the metal layer of the copending application could not form a refractive index gradient layer. The refractive index of such a layer would be constant.

Therefore, the subject matter of the claimed inventions in these two applications are only tangentially related and should not be subject to a double patenting rejection.

It is therefore believed that independent claim 16 distinguishes over the applied art of record and is not subject to a double patenting rejection.

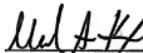
If the Examiner chooses to hold the double patenting rejection applicant holds any further response in abeyance until the provisional nature of the double patenting rejection is removed.

SUMMARY

In view of the forgoing, independent claim 16 is believed to be allowable over the applied art of record, and action towards that end is respectfully requested. Claims 17-28 and 31-33, which depend directly or indirectly from independent claim 16 are believed to be allowable based, at least, upon this dependence.

Should the Examiner wish to modify the application in any way, applicant's attorney suggests a telephone interview in order to expedite the prosecution of the application.

Respectfully submitted,



Mark A. Hixon
Registration No. 44,766

ATTORNEYS

Marshall & Melhorn, LLC
Four SeaGate - 8th Floor
Toledo, Ohio 43604
(419) 249-7114
(419) 249-7151 Facsimile
HIXON@MARSHALL-MELHORN.COM